ISFSI

INSTRUCT-O-GRAM

THE HANDS-ON TRAINING GUIDE FOR THE FIRE INSTRUCTOR

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Automatic Sprinklers

TASK

To review the value of sprinkler systems to citizens and to firefighters. To understand the function and proper operation of various sprinkler system devices and conditions detrimental to proper sprinkler operation.

Estimated Time: **4 hours**

INTRODUCTION

It is critical for each student to have a basic understanding of what a sprinkler system is and how it works. They must be aware of what they are expected to do during a fire operation in a building protected by an automatic fire sprinkler system. They need to know the various parts, how they operate, and contribute to proper sprinkler performance. This includes various valves, gauges and sprinkler heads.

CLASS OBJECTIVES

1. To identify specific valves found on sprinkler systems.
2. To define types and temperature ratings of sprinkler heads
3. To understand the function and readings on sprinkler systems.
4. To define reasons for improper performance of sprinkler systems.

PERFORMANCE OBJECTIVES

NFPA 1001 Standard for Firefighter Professional Qualifications

1. 5.3.14 Conserve property as a member of a team, given salvage tools and equipment and an assignment, so that the building and its contents are protected from further damage.
2. (A) Requisite Knowledge: The purpose of property conservation and its value to the public, methods used to protect property, types of and uses for salvage covers, **operations at properties protected with automatic sprinklers, how to stop the flow of water from an automatic sprinkler head, identification of the main control valve on an automatic sprinkler system**, and forcible entry issues related to salvage.
3. (B) Requisite Skills: The ability to cluster furniture; deploy covering materials; roll and fold salvage covers for reuse; construct water chutes and catch-alls; remove water; cover building openings, including doors, windows, floor openings, and roof openings; separate, remove, and relocate charred material to a safe location while protecting the area of origin for cause determination; **stop the flow of water from a sprinkler with sprinkler wedges or stoppers; and operate a main control valve on an automatic sprinkler system.**

PRESENTATION OUTLINE

Lesson Defined

- It is the purpose of this lesson to cover certain parts and devices that are a part of the system. These include valves, gauges, and the sprinkler heads, the latter in regard to the type and temperature rating.
- This IOG is not designed to cover the overall design and layout of sprinkler systems.

PRESENTATION PERFORMANCE OBJECTIVES

- The instructor will define and explain the use of valves.
- The instructor will define and explain the use of gauges
- The instructor will define and explain the types and ratings of sprinkler heads

VALVES

- Alarm Valve
  1. Operated by flow of water from main control valve of system when valve opens.
  2. Water enters intermediate chamber, pressurizes alarm line and fills retard chamber if there is one present.
  3. After retard chamber is full, or if none exists, water activates alarm switch; either pressure or vane type.
  4. Switch sends electrical signal and water flows to activate an electrically operated gong or mechanical water-motor gong.
  5. Alarm may be transmitted to remote station, central station, or proprietary station, preferably monitored 24 hours.
  6. To shut off alarm, close the alarm valve.
- Alarm Test Valve
  1. To determine that alarm valve line is open and will actuate alarm.
  2. Located in alarm test line below main valve.
  3. Operation simulates that of alarm valve.
  4. Should be indicating valve; O S& Y or similar to gas shutoff.
  5. Opening valve should cause electric alarm and water gong to sound; may take one or two minutes of water flow to actuate.
  6. Upon hearing alarm close valve.
  7. Only test alarm line not sprinkler system. (Note – Any supervising station on or off the premises must be notified prior to and at the conclusion of the test. Occupants must also be notified.)
- Drip (Drain) Valves
  1. To automatically drain different parts of the sprinkler system such as alarm lines and the fire department connection.
  2. May be called an automatic drip valve, drip, drain, ball drip, or velocity drain valve.
  3. In the ball drip valve, it must be determined that the balls moves freely and allows trapped water to seep out. This may be determined by use of a finger, pencil or something similar.
  4. The velocity drip valve or restricted orifice on the retard chamber must also be free of obstruction to allow for drainage.
  5. Some valves may be equipped with a spring-loaded push rod that allows the inner clapper to be moved. This may be operated by lifting or pushing in depending on the type, design, and model.
- Check Valves
  1. Similar to clapper valves; allow water to flow in one direction.
  2. Located in the fire department connection line and in the main supply line.
  3. May be installed in other locations according to the design of the system.
  4. Arrow on casing indicates direction of flow.
  5. Fire department Siamese usually has either single or double clapper valves

GAUGES

- Wet System
- Dry System

SPRINKLER SYSTEMS

- Wet system
  1. Two gauges; one indicating pressure on the service (house) side; the other on the supply (street) side.
  2. Readings are most often identical or close to identical.
  3. Fluctuations in the water supply may show on the service side with a higher reading than the supply side by indicating the highest pressure to which the system has been subjected (surge pressure).
  4. Supply side will indicate the actual static pressure at the time of the reading.
- Dry System (To include pre-action and deluge)
  1. Two gauges; one indicating water pressure under the control valve, the other indicating the air pressure above the control valve (clapper).
  2. Different readings may be found due to the design of the system; air pressure holding back the water pressure at a three or four to one ratio.
  3. Dry pipe valve is a different valve with a six to one ratio of square inches of surface so that air pressure requirement to hold clapper closed against the supply-side pressure is about 1/5 or 1/6 of the incoming water pressure. Three or four to one ratio used however, to make positive seal and hold against pressure surges.

SPRINKLER HEADS

- A fixed spray nozzle activated by a thermal sensing device.
- Numerous types and designs of operating element exist:
  1. Fusible links
  2. Quartzoid bulbs
  3. Solder pellet
- Heads must be marked to indicate:
  1. Temperature rating
  2. Date of manufacture
  3. Name of manufacturer
  4. Position for installation
- Types of sprinkler heads:
  1. Upright – discharges a proper stray pattern of water downward when upright.
  2. Pendent – discharges water downward when facing downward.
  3. Sidewall – mounted close to wall, directs spray in a conical pattern away from the wall; used to protect small rooms, vertical openings, atriums, etc.
  4. Directional – as the name implies, it is used to direct the spray in a specific direction or pattern for special applications.
  5. Flush/décor – used where appearance is a major concern, such as restaurants, lobbies, offices, etc.; most are flush mounted, chrome with fusible links set at temperature less than that of head behind cover; cover drops free before head fuses.
  6. Quick response – used where rapid response time is critical; has special heat collector (quick-response actuator) that gathers and directs heat to special solder in the fusible link.
  7. Open – this is used in a deluge system; heads are similar to standard heads, but without the fusible components.
  8. Coated – used where the normal atmosphere might affect and deter proper operation; lead or wax may be used as the coating; usually used in manufacturing locations over acid baths, plating tanks and similar areas.
  9. Water-spray projectors – have various orifices and deflector sizes for special installations.
  10. On-off heads – open when heated, close when temperature is cooled down, stopping the water flow.
  11. Foam head – used to discharge mechanical foam, usually in a deluge type operating system.

  Note: Standard sprinkler head orifice is ½" and pipe thread size is the same.

SPRINKLER HEAD TEMPERATURE RATINGS

- Based upon the maximum temperature normal at the level of the sprinkler and the expected rate of heat produced by a fire in the area.
- Temperature rating indicated by color coding of the frame arms or other authorized method.
- Coated sprinklers may have color on arms or a colored dot on top of the deflector.
- Decorative heads are not required to be color-coded but a colored dot may be found on the deflector.
- Color coding – In degrees Fahrenheit:
  1. Unpainted, partially black or chrome
     135-170
  2. White
     175-225
  3. Blue
     250-300
  4. Red
     325-375
  5. Green
     400-475
  6. Orange
     500-575

SPRINKLER SYSTEM RELIABILITY

- About 96 percent effective in controlling or extinguishing fire.
- Of the remaining 4% not controlled by the system 35% were due to system being shut down prior to fire; or
- Main control valve closed prematurely by the fire department or occupancy representatives.
- Improper maintenance, lack of water supply, partial protection, explosions and flash fires.
- Systems blocked by obstructions.

SUMMARY

In this month's *Instruct-O-Gram* we have presented the elements necessary to create an understanding of some basic information regarding automatic sprinkler systems. We urge you to retain each **IOG** in your training files, in order to allow for the orderly delivery of fire service training. We urge you to conduct a complete review of this standard prior to conducting any classroom sessions. We would also recommend that a copy of the standard be made available for each student. For volume discounts, contact the National Fire Protection Association at (617) 770-3000. You may also contact them on the Internet at www.NFPA.org.

This month's *Instruct-O-Gram* was prepared by Harry R. Carter, Ph.D., CFO, MIFireE.